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10/811,310

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Jeffrey J. Berkley

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EXAMINER

EISEN, ALEXANDER

ART UNIT

PAPER NUMBER

2629

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/811,310

Applicant(s)

BERKLEY ET AL.

Examiner

Alexander Eisen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 October 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 and 12-48 is/are pending in the application.
- 4a) Of the above claim(s) 44-48 is/are withdrawn from consideration.
- 5) ☒ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-17 and 25-43 is/are rejected.
- 7) ☒ Claim(s) 18-24 is/are objected to.
- 8) ☒ Claim(s) 44-48 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/8/06.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 13 recites: “the sensor array”. There is insufficient antecedent basis for this limitation in the claim.

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 40 and 43 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Both claims recite: “selectively varying a retracting bias”. The original specification as filed does not provide support for such limitation.

6. Claims 40 and 43 are also rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. There is no explanation in the specification of what the “retracting bias” is, which render claims 40 and 43 indefinite. For the purpose of further

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examination the examiner consider “means for selectively controlling tension” as not “further comprising means for selectively varying a retracting bias”.

***Election/Restrictions***

7. It appears that newly submitted claims 44-48 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: claims apparently directed to the embodiment in FIG. 11 of the disclosure, which was not claimed originally. This embodiment is independent and distinct from the embodiment in FIG. 8, which was claimed from the beginning and is represented by claims 18-24.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 44-48 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3-7, 9, 10, 12, 14, 29-33, 40 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al., US 5,305,429 (reference of record), hereinafter Sato.

With respect to claim 1 Sato discloses a haptic interface device (FIG. 1) to provide haptic interaction to a user manipulating a tool, the haptic interface device comprising an attachment point 10; a first cable 12-1 having a first and a second end (FIG. 3), the first end coupled to the

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attachment point; a first tool translation effector device (relay 44-46-48) having coupled thereto the second end of the first cable, the first cable is retracted or paid out accordingly by the first tool translation device, the first tool translation effector device including controlling means for selectively varying a tension on the first cable (col. 6, line 65 – col. 7, line 13); metering means 24 for metering the first cable as it is retracted and paid out; and establishing means 26 for establishing, during an initialization procedure, a distance between the first tool translation effector device and the attachment point (col. 4, lines 6-27).

As pertaining to claim 3, the establishing means includes a controller configured to direct the first tool translation effector device to retract, during an initialization procedure, the first cable until the attachment point is at a selected position relative to the first tool translation effector device (col. 4, lines 49-50).

As pertaining to claim 4, the establishing means includes a memory 28 configured to receive, prior to a shutdown of the device, a known distance and to provide the known distance during a startup procedure.

As pertaining to claim 5, the establishing means includes at least one sensor (encoder 42 in FIG. 3) configured to determining a position of the attachment point relative to the first tool translation effector device.

As pertaining to claim 6, Sato further teaches that the establishing means includes means for reestablishing the distance from time to time during operation (updating section; col. 7, lines 14-33).

As pertaining to claim 7, Sato discloses a second, third, and fourth cables (12-1 through 12-4) coupled at respective first ends to the attachment point 10 (see FIG. 3); second, third, and

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fourth tool translation effector devices positioned, relative to each other and to the first tool translation effector device, such that each of the first, second, third, and fourth tool translation effector devices (14-1 through 14-4; FIG. 1) occupies a vertex of a tetrahedron (a figure delineated by four vertices 14-1 through 14-4); and a sensor array (four encoder, one per each “fulcrum” 14-1-14-4) associated with the attachment point and configured to provide signals corresponding to an orientation of the attachment point.

As pertaining to claim 9, Sato teaches that the attachment point is configured to receive the tool (user finger), the haptic interface device further comprising: second, third, and fourth cables (12-1-4) coupled at respective first ends to the attachment point; second, third, and fourth tool translation effector devices positioned, relative to each other and to the first tool translation effector device, such that each of the first, second, third, and fourth tool translation effector devices (14-1-4; corresponding to P0-P3 vertices in FIG. 4) occupies a vertex of a tetrahedron; and a sensor array associated with the attachment point and configured to provide signals corresponding to an orientation of the tool (see discussion above in relation to claim 7, containing a similar subject matter).

As pertaining to claim 10, the haptic interface device further comprises a second and third cables 12-2 and 12-3 coupled at respective first ends to the attachment point; and second and third tool translation effector devices 14-2 and 14-3 positioned in a triangular configuration relative to each other and to the first tool translation effector device 14-1.

As pertaining to claim 12, Sato discloses a haptic device for operation by a user, comprising a user interface tool configured to be manipulated by the user and moved within a volume of space; a first, a second, a third, and a fourth tool translation effector device (14-2

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through 14-4), each coupled to a support structure in positions such the first, second, third, and fourth tool translation effector devices define between them a tetrahedron within the volume of space, each of the tool translation effector devices including a respective spool 38 and a respective encoder 42 configured to provide a signal corresponding to rotation of the respective spool; first, second, third, and fourth cables each having a respective first and a respective second end, the first end of each of the first, second, third, and fourth cables coupled to the user interface tool (a user finger at instruction point 10) and the second end of each of the first, second, third, and fourth cables wound and unwound (col. 3, line 59) on the spool of a respective one of the tool translation effector devices.

As pertaining to claim 14, the haptic device further comprises a processor system (FIG. 2) coupled to receive information from the sensor array and coupled to receive the signals from the respective encoders, the processor system configured to determine movement and orientation of the tool therefrom.

As pertaining to claim 29, Sato discloses a method comprising applying tension to each of a plurality of cables each having respective first and second ends, each of the plurality of cables coupled at its respective first end to a tool, and at its respective second end to a respective anchor point; measuring a change of cable length between the tool and each respective anchor point; and establishing an initial length of cable between the tool and each of the anchor points (equation (1) in page 4).

As pertaining to claim 30, establishing an initial length of cable comprises moving the tool in turn to each of the anchor points such that the length of cable between the tool and the respective anchor point is effectively zero (it is understood that the movement of a tool is limited

by vertices (anchors) and the initial lengths can be determined from the equation (1) when moving the tool up to the respective anchors, i.e. to bringing the tool effectively to the point  $P_0$ , where  $l_0=0$ , and  $l_1$ ,  $l_2$  and  $l_3$  will constitute the initial lengths, then to the points  $P_1 - P_3$ , etc.

As pertaining to claim 31, establishing an initial length of cable is performed during a startup procedure (the initial lengths of the cable, i.e. the minimum required for performing manipulations between the vertices to full extent, need to be known in advance, and such requirements is imperative and therefore inherent to the process.

As pertaining to claim 33, establishing an initial length of cable comprises tracking a position of the tool; and correlating the position of the tool with known positions of the anchor points (as in case of establishing any tracking lengths and positions of the tool).

As pertaining to claims 40 and 43 Sato teaches selectively controlling tension (col. 7, lines 8-13).

10. Claims 1, 12, 14, 16, 17, 26-28 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Kim et al., hereinafter Kim, "Design of Tension Based Haptic Interface: SPIDAR-G", DSC-Vol. 69-2, Proceedings of ASME, 5-10 November 2000 (the reference provided with the Applicant's IDS filed on 12/08/2006).

As pertaining to claim 1 Kim discloses a haptic interface device (Fig. 2) to provide haptic interaction to a user manipulating a tool (grip P), the haptic interface device comprising an attachment point P1; a first cable (a string between P1 and vertices Q1 or Q2) having a first and a second end, the first end coupled to the attachment point; a first tool translation effector device (a motor and a pulley located in the vertex Q1) having coupled thereto the second end of the first



cable, the first cable is retracted or paid out accordingly by the first tool translation device; the first tool translation effector device including controlling means for selectively varying a tension on the first cable (p. 1246, top of the left column); metering means (encoder) for metering the first cable as it is retracted and paid out; and establishing means for establishing, during an initialization procedure, a distance between the first tool translation effector device and the attachment point (see a series of equations following above description).

As pertaining to claim 12, Kim discloses a haptic device for operation by a user, comprising a user interface tool configured to be manipulated by the user and moved within a volume of space; a first, a second, a third, and a fourth tool translation effector device, each coupled to a support structure in positions such the first, second, third, and fourth tool translation effector devices define between them a tetrahedron within the volume of space, each of the tool translation effector devices including a respective spool and a respective encoder configured to provide a signal corresponding to rotation of the respective spool; first, second, third, and fourth cables each having a respective first and a respective second end, the first end of each of the first, second, third, and fourth cables coupled to the user interface tool (a user finger at instruction point 10) and the second end of each of the first, second, third, and fourth cables wound and unwound on the spool of a respective one of the tool translation effector devices (pp. 1245-46).

As pertaining to claim 14, the haptic device further comprises a processor system coupled to receive information from the sensor array and coupled to receive the signals from the respective encoders, the processor system configured to determine movement and orientation of the tool therefrom (p. 1247).

As pertaining to claim 16, each of the first, second, third, and fourth tool translation effector devices further comprises a motor coupled to the respective spool, each of the motors operable to selectively apply tension to the respective cable.

As pertaining to claim 17, the processor system is configured to establish an initial position of the tool by retracting, in turn, each of the first, the second, the third, and the fourth cables to a known length position.

As pertaining to claim 26, the processor system is configured to maintain a virtual environment within which the user interface tool is operated, and to provide feedback from the virtual environment to the user interface tool (see the abstract).

As pertaining to claims 27-28, the haptic device further comprises a remote tool (a virtual object on the screen), and wherein the processor system is configured to control operation of the remote tool in accordance with the movement and orientation of the user interface tool, and the processor system is configured to provide feedback from the remote tool to the user interface tool (in the form of calculated forces applied to the strings).

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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12. Claims 2, 15 and 34-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim, as applied to claims 1, 12 above, and further in view of Lefkowitz et al., US 5,440,476, hereinafter Lefkowitz.

Kim teaches all limitation of claims above with exception of compensation for a change in ratio between changes in distance from the first tool translation device to the attachment point and angular rotation of the spool.

Lefkowitz brings up attention to a problem of changing ratio when using spools and cable for 3D positioning of an object (col. 4, ll. 10-17) and suggest using compensating means.

Therefore it would have been obvious to one of ordinary skill in the art at the time when the invention was made to employ compensating means taught by Lefkowitz in the haptic interface device of Kim in order to compensate for the changing in the spool diameters and improve the accuracy of measurements.

13. Claims 8, 38, 39 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim.

While Kim does not teach explicitly a sensor for determining rotation of the tool, Kim teaches sensors detecting the movement of a tool (grip) having four points P1-P4 in a shape of a cross, position of which can be expressed using equations shown in page 1246. It would have been obvious to one of ordinary skill in the art at the time when the invention was made that knowing the displacement of those four points, the rotation of the tool can be easily derived or judged also since that displacement designates the rotation of the tool, pitch, yaw and roll (around three perpendicularly axes) including.

14. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato.

While Sato does not disclose explicitly that establishing an initial length of cable comprises storing a value indicative of a known length of each cable in a memory during a shutdown procedure; and recovering the value indicative of the known length of each cable from the memory during a startup procedure, such procedures of storing current values during shutdown and retrieving the latter during next start in order to provide the continuity of an activity is well known and widely accepted in the art of measurements and therefore it would have been obvious to one of ordinary skill in the art at the time when the invention was made to implement such with reasonable expectation of success and without undue experimentation.

***Allowable Subject Matter***

15. Claims 18-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: none of the references, either singularly or in combination, teach or fairly suggest a haptic device for operation by a user, comprising a user interface tool configured to be manipulated by the user and moved within a volume of space; a first, a second, a third, and a fourth tool translation effector device, each coupled to a support structure in positions such the first, second, third, and fourth tool translation effector devices define between them a tetrahedron within the volume of space, each of the tool translation effector devices including a respective spool and a respective encoder configured to provide a signal corresponding to rotation of the respective spool; first, second, third, and fourth cables each having a respective first and a respective second end, the first end of each of the first, second, third, and fourth cables coupled to the user interface tool (a

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user finger at instruction point 10) and the second end of each of the first, second, third, and fourth cables wound and unwound on the spool of a respective one of the tool translation effector devices and further comprising a port coupled to the support structure; and wherein the user interface tool comprises a tool shaft having a first and a second end, the first end of each of the first, second, third, and fourth cables coupled to the first end of the tool shaft, the tool shaft passing through the port such that the tool shaft pivots at the port and manipulation of the second end of the tool shaft is reflected in movement of the first end of the tool shaft.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Eisen whose telephone number is (571) 272-7687. The examiner can normally be reached on M-F (9:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sumati Lefkowitz can be reached on (571) 272-3638. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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A handwritten signature in black ink, appearing to read 'Alexander Eisen', written in a cursive style.

Alexander Eisen  
Primary Examiner  
Art Unit 2629

26 December 2006